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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/629,742	07/30/2003	Alfred I-Tsung Pan	200206676-1	8919

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EXAMINER
LAMBELET, LAWRENCE EMILE

ART UNIT	PAPER NUMBER
1732	

DATE MAILED: 12/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/629,742	PAN ET AL.	
	Examiner	Art Unit	
	Lawrence Lambelet	1732	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 June 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17,21-25 and 31-38* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17,21-25 and 31-38* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant orally elected claims 1-17 and 21-25 with traverse. Applicant did not affirm the election in reply to the Office Action filed on 6/22/2006, as required. Because applicant did not distinctly and specifically point out, in the reply filed on 9/22/2006, the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

The requirement is deemed proper and is therefore made FINAL.

Response to Amendment

Applicant's amendment filed on 6/22/2006 is acknowledged. Cancelled claims 18-20 and 26-30, amended claims 1-6, 8-9, 12-13, 17, and 21, and new claims 31-38 are placed of record in the file. Claims 1-17, 21-25, and 31-38 are pending for action.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-2, 4-11, 14-15, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ederer et al (U.S. Patent 6,838,035), and further in view of Jang et al (U.S. Patent 6,405,095).

Ederer et al, hereafter "Ederer", discloses a method of forming a three-dimensional structure reading on claim 1. Ederer teaches compounding multiple layers wherein liquid drops are selectively deposited (in a pattern) to become solidified and surrounded with a supporting fluid. The supporting fluid is maintained at a level substantially at the top of the deposited layer and is sufficiently dense, and therefore viscous, as to perform a support function for the structure. See reference claim 1 and lines 45-65 in column 2 and 15-25 in column 4. Ederer further teaches a control for raising and maintaining the level at lines 55-63 in column 7.

Ederer teaches that the support fuild can "wet" the top surface thereby providing a formation surface for the next layer of deposition, as required by claim 14. See lines 8-21 in column 3. Ederer further teaches that the viscous liquid provides support for over-extending structure at lines 24-35 in column 5.

Ederer implicitly teaches that the supporting fluid impregnates the porous structure within, as required by claim 15. It is an inherent property of a fluid to flow into interstices spaces.

Ederer does not teach a composition of the supporting fluid as a molten wax, as required by claim 36, but does teach such a composition for a build material. See lines 45-50 in column 6. Ederer also teaches that density of the build material and supporting

fluid is matched. It would have been an obvious choice for one skilled in the art to select molten wax as an equivalent material for the supporting fluid.

Ederer does not teach a first and second different deposited liquid where the second liquid forms an external surface, as required by claim 1.

Jang et al, hereafter "Jang", does teach droplet deposition of multiple materials in selective zones of a layer. See lines 11-20 in column 6 and 19-28 in column 7. Jang further teaches forming an outer boundary with one material thereby to define an interior space to be filled with a second material. See lines 53-67 in column 19 and 1-10 in column 20. The fill material of the reference is deposited as a powder and is transformed by a local heat source to a molten state before solidifying. The switch of a powder deposition, which subsequently undergoes a phase change, for a liquid droplet deposition would have been obvious as a choice of alternative for someone skilled in the art.

Ederer does not teach a first material as a resin, as required by claim 2, or a thermoset resin, as required by claim 8, or as a UV settable resin with irradiation, as required by claim 9, or as a metal, as required by claim 5. Ederer further does not teach a second material as a metal, as required by claims 4, 5, and 8, or as a thermoplastic resin, as required by claim 10.

Jang teaches that first and second deposit materials can be selected from various types, including metal, thermoplastic resin, and UV thermoset resin. See lines 47-68 in column 13 and lines 1-26 in column 14.

Ederer and Jang are combinable because they are concerned with a similar technical field, namely, rapid prototyping. One of ordinary skill in the art at the time of the invention would have found it obvious to include in the method of Ederer the combination of different materials as taught by Jang, and would have been motivated to do so to obtain coloration effects. See lines 63-65 in column 19 of Jang.

Ederer does not teach heating to cause a second deposited material to flow into voids of the first material, as required by claims 6 and 11, or heating sufficiently to alloy the materials, as required by claim 7.

Jang does teach heating a second deposited material to a molten state at lines 11-36 in column 6. It would have been obvious to one skilled in the art that a molten material formed in contact with a first material having interstices spaces resulting from liquid drop deposition would flow by capillary action into those spaces. Heating sufficiently to alloy constitutes a results-effective variable which would have been an obvious choice to one skilled in the art.

One of ordinary skill in the art at the time of the invention would have found it obvious to include in the method of Ederer the infusion of materials as taught by Jang and would have been motivated to do so to densify, and consequently strengthen, the structure.

Claims 12-13, 16-17, and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ederer in view of Jang as applied to claims 1-2, 4-11, 14-15, and 36, and further in view of Fink.

Ederer/Jang teaches the method of claims 1-2, 4-11, 14-15, and 36, as discussed above.

Ederer/Jang does not teach removing excess material, as required by claim 16, or excess resin material, as required by claim 37, or hardening to increase smoothness, as required by claim 17. Ederer/Jang further does not teach the second material as copper, as required by claim 12, or heating to soften and flow into voids, as required by claim 13.

Fink does teach a liquid occupying voids formed by a first material. This is shown in the reference in Fig's 3 and 4 and further disclosed at lines 15-40 in column 3. Reference is made to viscosity enhancement at lines 45-48 in column 3. The removal of excess liquid is taught at lines 55-60 in column in column 3. Fink further teaches copper as a second material, and heating in a post-treatment to fuse (harden) the copper. See lines 20-34 in column 17. Fink still further teaches a second material as a resinous polymer. See lines 60-68 in column 17.

Ederer/Jang and Fink are combinable because they are concerned with a similar technical field, namely, rapid prototyping. One of ordinary skill in the art at the time of the invention would have found it obvious to include in the method of Ederer/Jang the combination of materials, as taught by Fink, and would have been motivated to do so to in order to electrical conductance. See lines 24-28 in column 17 of Fink.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ederer in view of Jang as applied to claims 1-2, 4-11, 14-15, and 36, and further in view of Prinz et al (U.S. Patent 5,301,415).

Ederer/Jang teaches the method of claims 1-2, 4-11, 14-15, and 36, as discussed above.

Ederer/Jang does not teach first and second materials having different melting points, as required by claim 3.

Prinz et al, hereafter "Prinz", teaches a lower melt point for the complementary material. See lines 18-24 in column 4.

Ederer/Jang and Prinz are combinable because they are concerned with a similar technical field, namely, rapid prototyping. One of ordinary skill in the art at the time of the invention would have found it obvious to include in the method of Ederer/Jang the dual melt-point combination, as taught by Prinz. The motivation to do so would have been to easily remove the complementary material to free the structure. See lines 20-24 in column 4 of Prinz.

Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ederer in view of Jang as applied to claims 1-2, 4-11, 14-15, and 36, and further in view of Edie et al (U.S. Patent 6,579,479).

Ederer/Jang teaches the method of claims 1-2, 4-11, 14-15, and 36, as discussed above.

Ederer/Jang do not teach silver and tin solder for first and second materials, as required by claim 38.

Edie et al, hereafter "Edie", teaches a droplet composition comprised of multiple materials, including sliver and tin in a solder mixture. See lines 1-4 in column 3.

Ederer/Jang and Edie are combinable because they are concerned with a similar technical field, namely, droplet deposition in a liquid. One of ordinary skill in the art at the time of the invention would have found it obvious to include in the method of Ederer/Jang the dual metal composition, as taught by Edie. The motivation to do so would have been to select materials compatible with drop formation in a drop-on-demand system. See lines 10-20 in column 7 of Edie.

Claims 21, 25, and 31-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ederer, and further in view of Fink et al (U.S. Patent 5,510,066).

Erderer discloses a method of forming a three-dimensional structure reading on claim 21. Ederer teaches ejecting drops from a program-controlled drop-on-demand application device with planar functionality. See Fig 3 and lines 28-35 in column 7. Ederer further teaches compounding multiple layers wherein liquid drops are selectively deposited (in a pattern) to become solidified and surrounded with a supporting fluid. The supporting fluid is maintained at a level substantially at the top of the deposited layer and is sufficiently dense, and therefore viscous, as to perform a support function for the structure. See reference claim 1 and lines 45-65 in column 2 and 15-25 in column 4.

Ederer teaches high viscosity at room temperature and non-detrimental reactivity of the supporting fluid, as required by claim 25. See lines 54-67 in column 2 and 1-3 in column 3. Ederer describes the supporting fluid as having a comparable density to the solid form of the first deposited liquid, hence high viscosity. Ederer also describes the supporting fluid as being effective as a separation agent, hence devoid of reactivity.

Ederer teaches a porous structure is submerged in a supporting fluid. See Fig. 1e. The interpenetration, or impregnation, of the fluid into the structure, as required by claim 21, would have been an effect of an inherent property of the fluid.

Ederer teaches that the level of the supporting fluid is filled substantially up to the top surface of the building material, as required by claim 31. See lines 57-63 in column 2.

Ederer teaches that a sensor regulates the level of the supporting fluid, as required by claim 34. See lines 55-63 in column 7.

Ederer teaches that the supporting fluid supports over-extending portions of the build material, as required by claim 33. See lines 25-35 in column 5.

Ederer does not teach solidifying the thus invested fluid, as required by claim 21.

Fink et al, hereafter "Fink", teaches a post-treatment process of an object formed by the juxtaposition of two liquids selectively deposited as drops to harden and form an object. See Fig's 3 and 4 and lines 15-40 in column 3 and 33-54 in column 11. One of ordinary skill in the art would have recognized the nexus between the two forms of juxtapositioned liquids, the two forms being the supporting liquid of Ederer on one hand and the alternate liquid of Fink on the other.

Ederer does not teach that the supporting fluid comprises a resin, as required by claim 32, or that the resin becomes polymerized in voids, as required by claim 35.

Fink teaches that a second material (viscous liquid) in the form of a polymeric binder can be polymerized by heat. See lines 48-54 in column 11.

Ederer and Fink are combinable because they are concerned with a similar technical field, namely, rapid prototyping. One of ordinary skill in the art at the time of the invention would have found it obvious to include in the method of Ederer the post-processing, as taught by Fink. The motivation to do so would have been to strengthen the structure. See lines 30-34 in column 11.

Claims 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ederer in view of Fink as applied to claims 21, 25, and 31-35, and further in view of Jang.

Ederer/Fink teaches the method of claims 21, 25, and 31-35, as discussed above.

Ederer/Fink does not teach ejecting drops of first and second materials with the second material forming a predetermined portion of the layer, as required by claim 22. Ederer/Fink further does not teach heating the second material to flow into recesses, as required by claim 23, or heating first and second materials to alloy, as required by claim 24.

Jang teaches two materials forming an outer boundary and an interior. See lines 55-65 in column 19. Jang further teaches heating a second deposition material to a

molten state at lines 11-36 in column 6. It would have been obvious to one skilled in the art that a molten material formed in contact with a first material having interstices spaces resulting from liquid drop deposition would flow by capillary action into those spaces. Heating sufficiently to alloy constitutes a results-effective variable which would have been an obvious choice to one skilled in the art.

Ederer/Fink and Jang are combinable because they are concerned with a similar technical field; namely, rapid prototyping. One of ordinary skill in the art at the time of the invention would have found it obvious to include in the method of Ederer/Fink the bi-material structure of Jang. The motivation to do so would have been to eliminate the "staircase effect" by creating a boundary zone of finer droplets. See lines 8-13 in column 18 of Jang.

Response to Arguments

Applicant's arguments, filed 9/22/2006, with respect to the rejection(s) of independent claim(s) 1 and 21 (as amended) under 35 U.S.C. § 102(e), have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made.

Independent claim 1 is rejected under 35 U.S.C. § 103(a) in view of Ederer and Jang, as are dependent claims 2, 4-11, 14-15, and 36. Independent claim 21 is rejected in view of Ederer and Fink, as are dependent claims 25 and 31-35. Dependent claims 22-24 are rejected in view of Ederer/Fink and Jang. Dependent claims 12-13, 16-17, and 37 are rejected in view of Ederer/Jang and Fink. Dependent claim 3 is rejected in view

of Ederer/Jang and Prinz. Dependent claim 38 is rejected in view of Ederer/Jang and new reference, Edie et al (U.S. Patent 6,579,479).

The passage citations for all references quoted in the discussion below are given in the rejection section above.

Applicant argues that Ederer does not teach the following limitations: Supplying a viscous liquid to the top of the most recently formed layer, supporting the material and filling voids, removing the object and solidifying the viscous liquid in the voids, and ejecting drops of first and second liquefied materials where the second liquid forms an external surface.

In response, Ederer does teach that a supporting fluid is maintained at a level substantially at the top of a deposited layer. Ederer further teaches the supporting fluid is of sufficient density to support over-extended structure. Ederer modified by Fink teaches a bi-material composition wherein voids are interpenetrated and hardening follows in a post- treatment. Ederer modified by Jang teaches first and second liquefied materials defining exterior and interior portions.

Applicant argues that Jang does not teach first and second different liquid materials. Jang teaches a first liquid material and a melt pool which constitutes a second liquid upon application of heat. The order in which heat is applied to liquefy, as in before or after deposition of material, does not carry weight.

Applicant argues that alloying was not taught in the combined teachings of Ederer, Jang and Prinz. In response, heating is taught in Ederer modified by Jang.

Examiner argues that heating to a sufficient degree to alloy materials is a results-effective variable which would have been obvious for one of ordinary skill in the art.

Applicant further argues that the use of two metals, or the use of a thermoplastic with UV settable resin, or the use a metal with a resin, were not taught in the combined teachings of Ederer, Jang and Prinz. In response, Ederer modified by Jang teaches first and second deposit materials selected from metals, thermoplastic resins and UV thermoset resins.

Applicant argues that a viscous liquid impregnating and entering voids is not taught in the combined teachings of Ederer and Fink. Applicant correctly states that in the Office Action of 6/22/2006 it was conceded that Ederer did not teach this. However, Examiner retracts this concession in favor of a different argument. It is a matter of prima facie obvious that any porous object submerged in a liquid would be impregnated by that liquid. Ederer teaches a supporting fluid wherein and whereon a patterned deposition in liquid droplet form is solidified into an object, and it follows that impregnation and occlusion of voids would result.

Applicant further argues that hardening of the viscous liquid in voids resulting in surface smoothness is not taught in the combined teachings of Ederer and Fink. In response, hardening of material in a composite is taught by Fink. Ederer teaches an impregnated viscous material (see above), and Jang teaches a second material smoothing an exterior surface. The combined teachings of Ederer, Jang, and Fink meet this limitation requirement.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lawrence Lambelet whose telephone number is 571-272-1713. The examiner can normally be reached on 8 am-4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christina Johnson can be reached on 571-272-1176. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LEL
11/28/2006

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SUPERVISORY PATENT EXAMINER
12/1/06